Measurement of azimuthal anisotropy of hadron In AuAu $\sqrt{sNN}$=39GeV at RHIC-PHENIX

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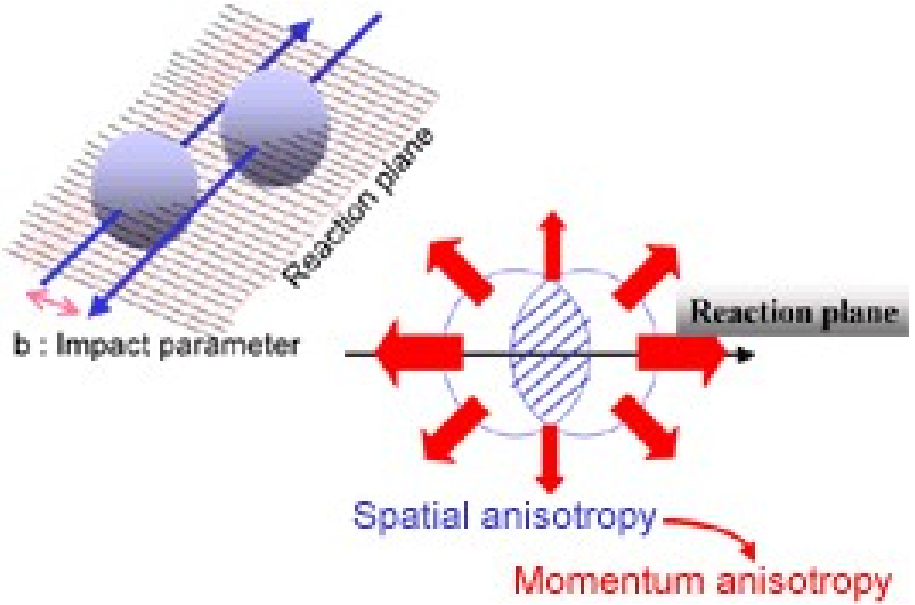
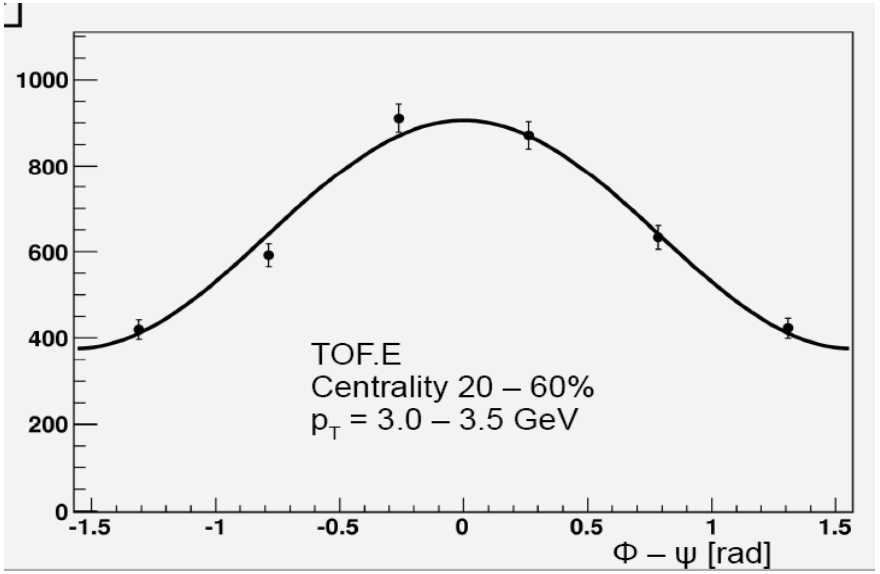
for the PHENIX collaboration

Azimuthal anisotropy





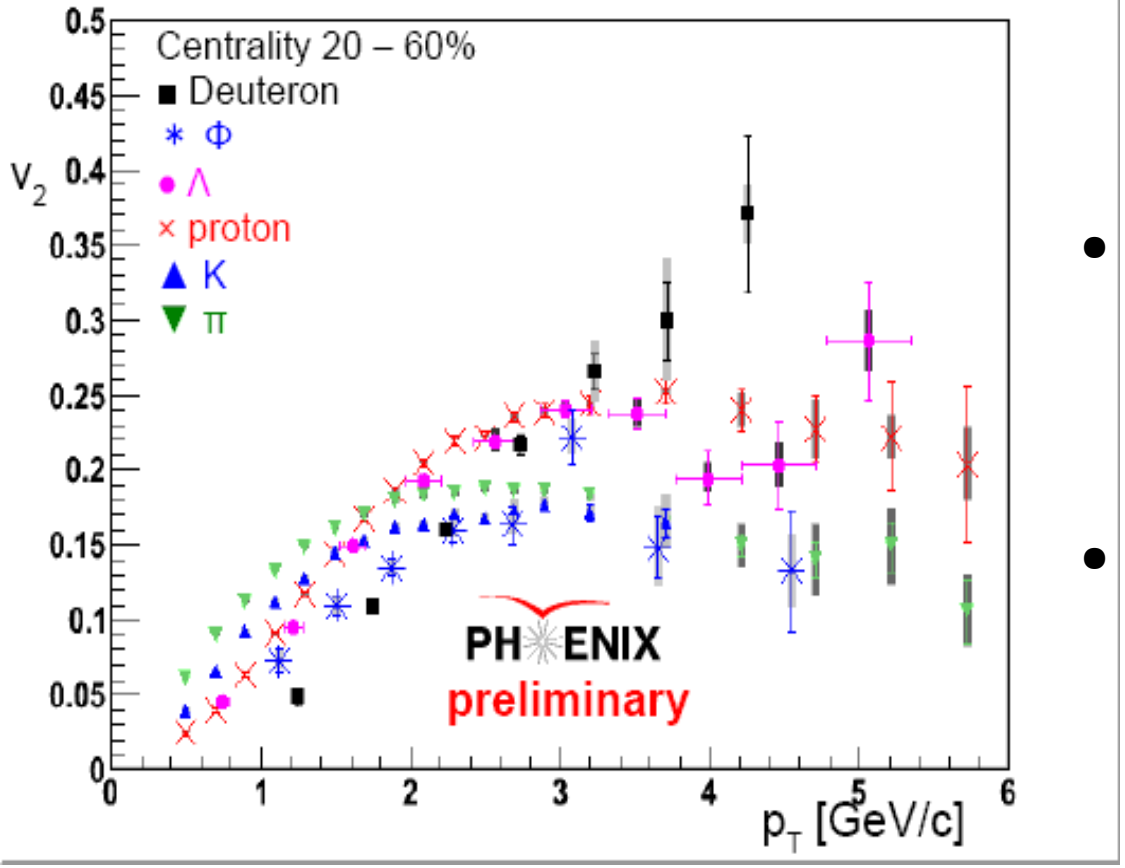
- Azimuthal anisotropy depends on initial kinematics
  - Elliptical particle emission angle distribution for non-central collision
- It is measured as 2nd term of Fourier series

$$\frac{dN}{d\Phi} \propto 1 + 2\,v_2 \cos 2\left(\Phi - \Psi\right)$$

Ψ : reaction plane angle

Particle Identified v_2

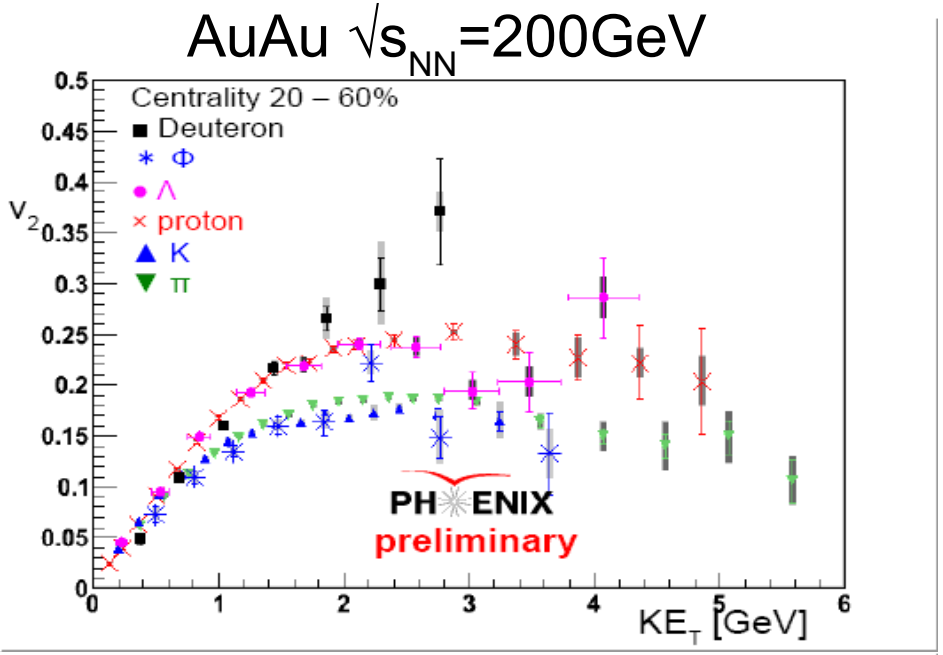
AuAu $\sqrt{s_{NN}}$=200GeV

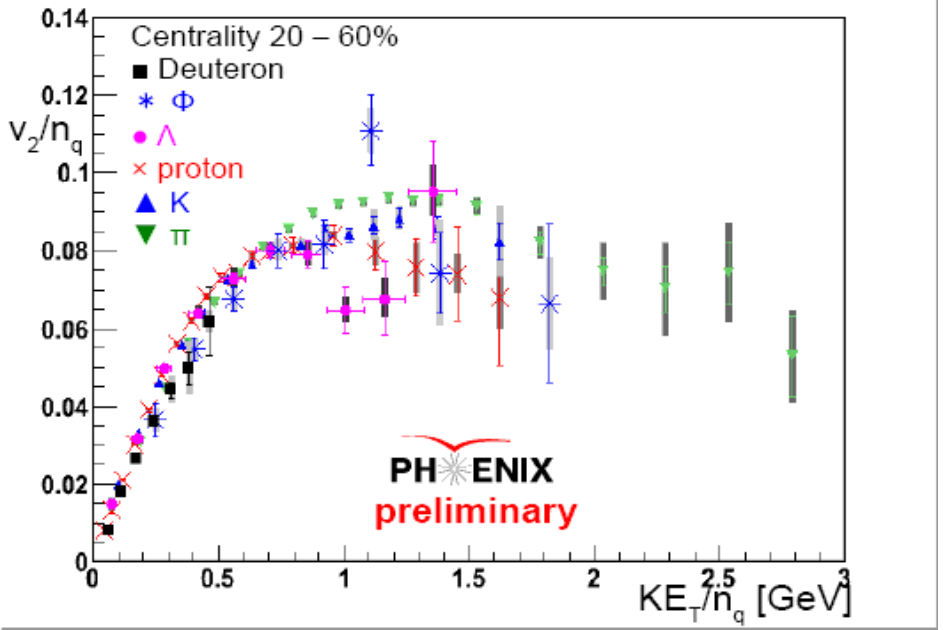


- These are characteristic for each particle specie
- Heavy particle is shifted to high momentum
- Meson, baryon and Ion are deviated at p_T>2GeV/c

Number of constituent quark scaling

AuAu $\sqrt{s_{NN}}$=200GeV

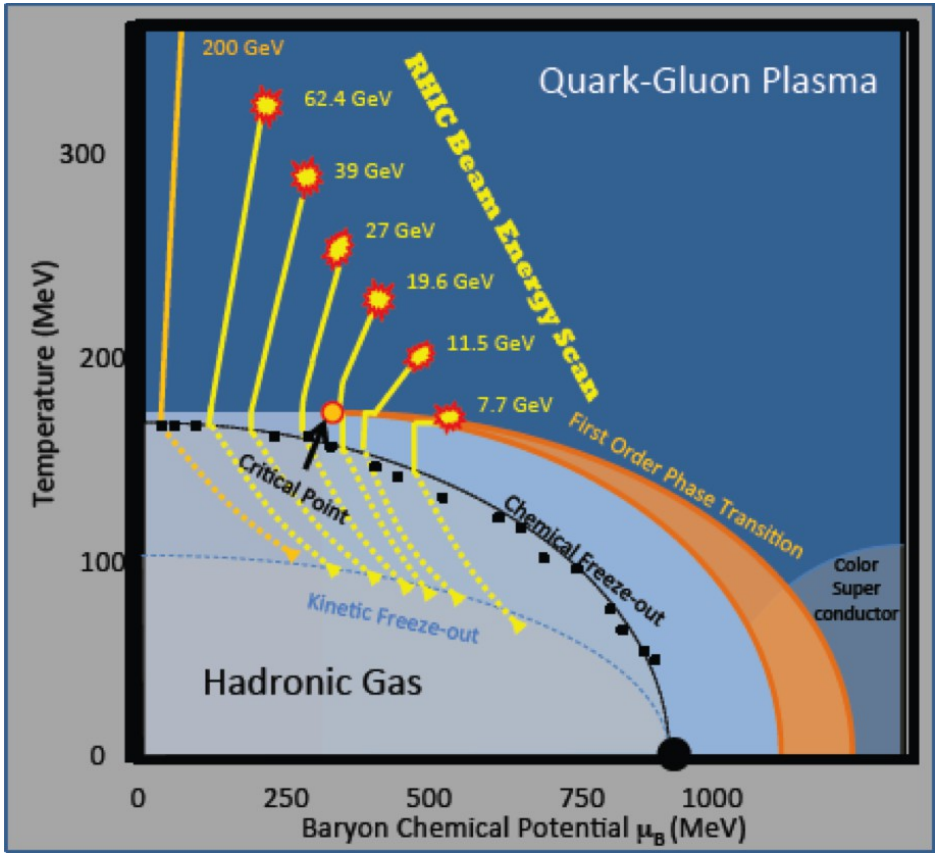




- KET scale
  - Describe the momentum shift
  - Consistent separately meson, baryon or ion
- Nq scale
  - Consistent at KET<0.7GeV
  - Collective flow of qiarks

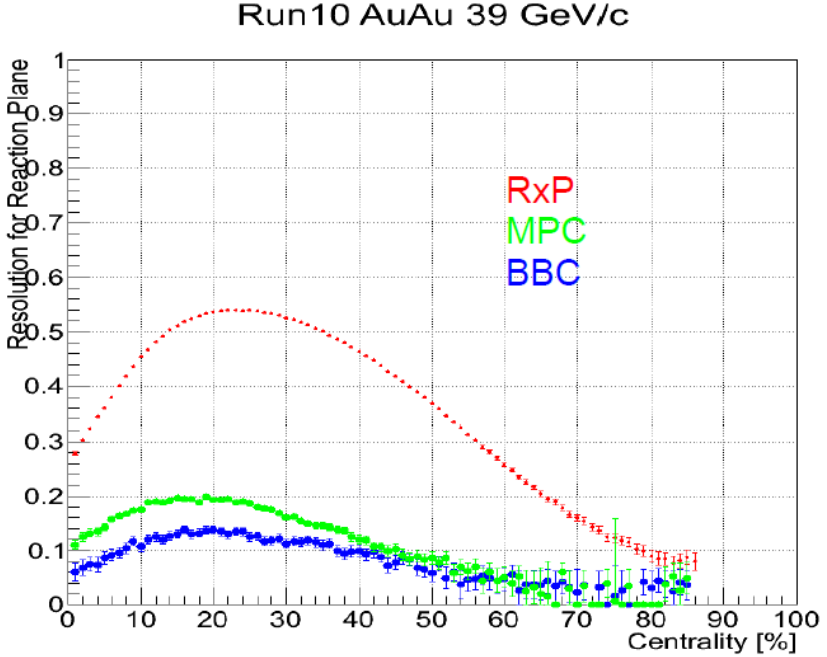
$$KE_T = \sqrt{(M^2 - P_T^2)} - M$$

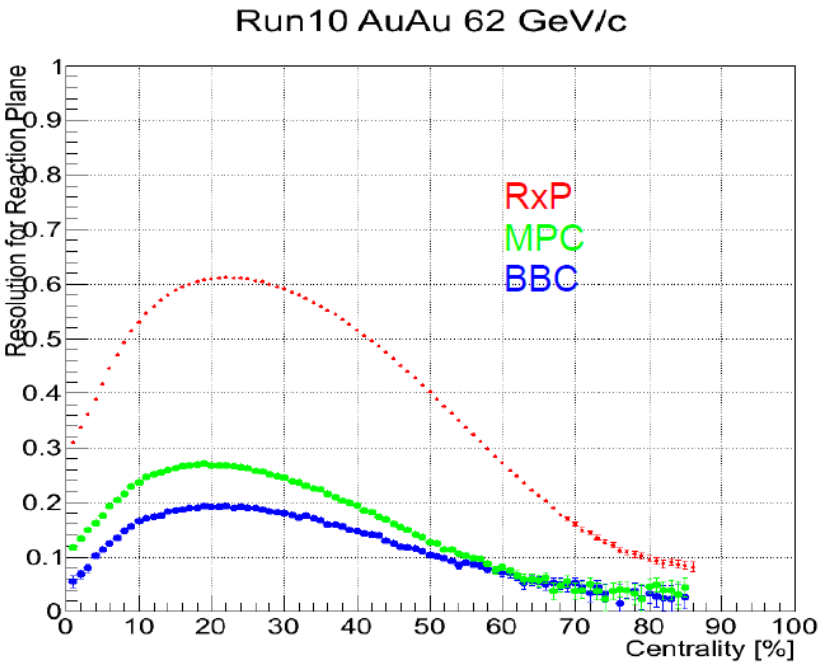
Beam energy scan with v_2 analysis



- Brake of NCQ scaling
- Threshold of QGP
- Search the Critical point

Reaction Plane Resolution of PHENIX



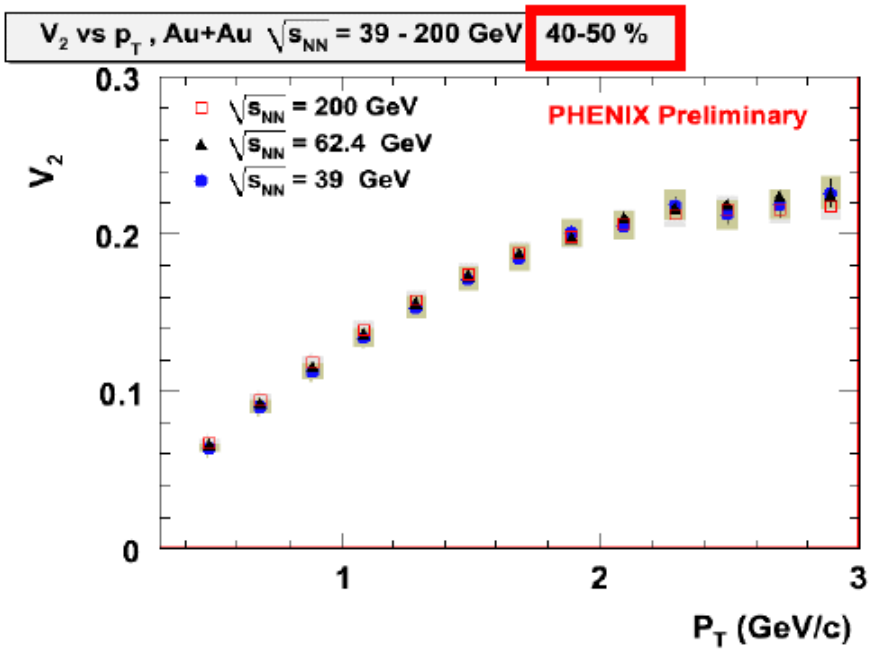


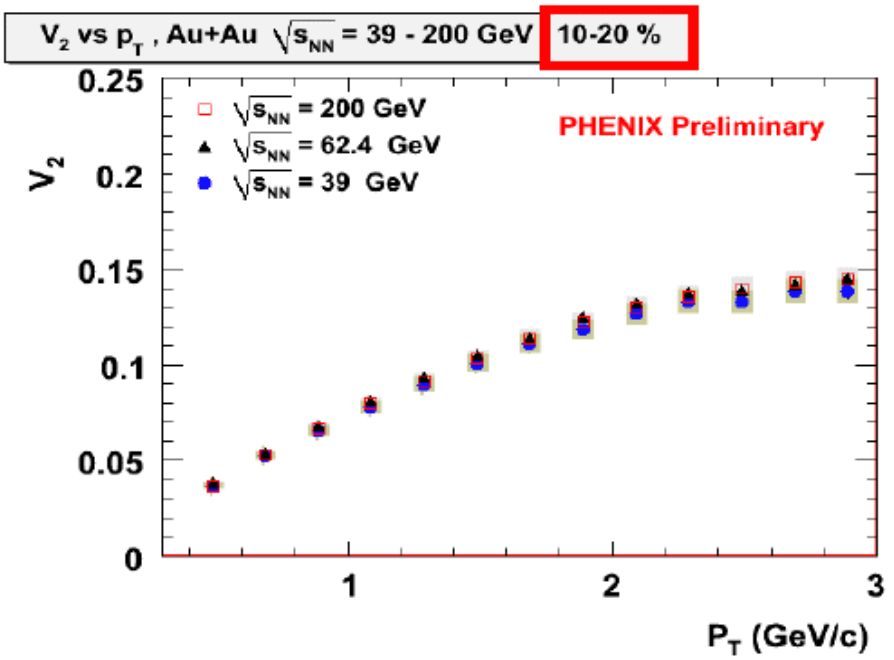
$$v_{2\,observe} = v_{2\,real} \times \left\langle \cos 2\left(\Psi_{real} - \Psi_{observe}\right)\right\rangle$$

reaction plane resolusion
<cos ⊿Ψ>

$$\delta v_2 \sim \frac{1}{\left\langle \cos 2\left(\Psi_{real} - \Psi_{observe}\right)\right\rangle} \times \frac{1}{\sqrt{N}}$$

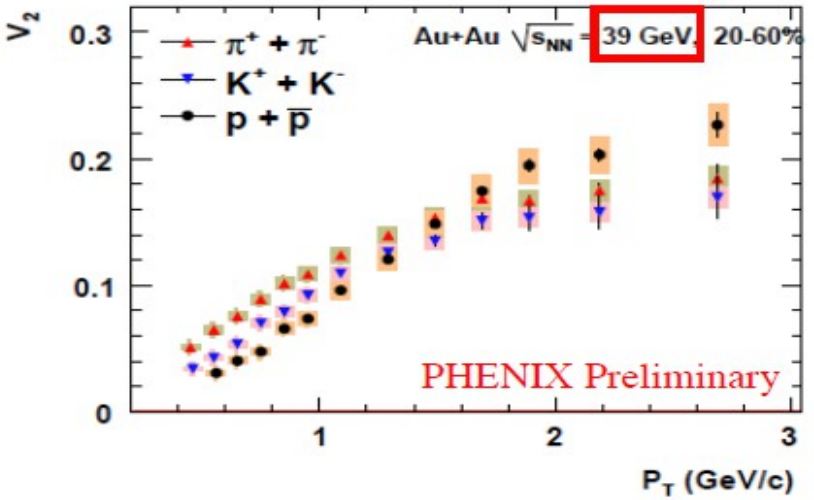
Charged hadron v_2 for $\sqrt{s_{NN}}$ = 39, 62 200GeV

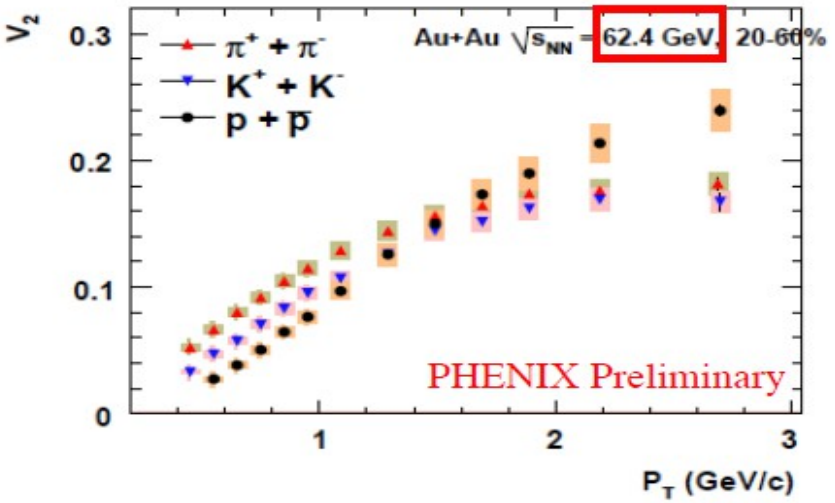


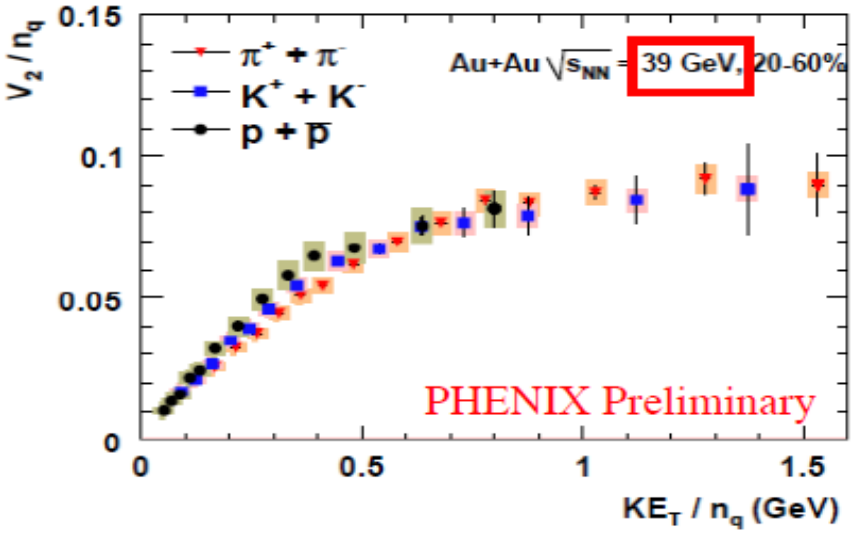


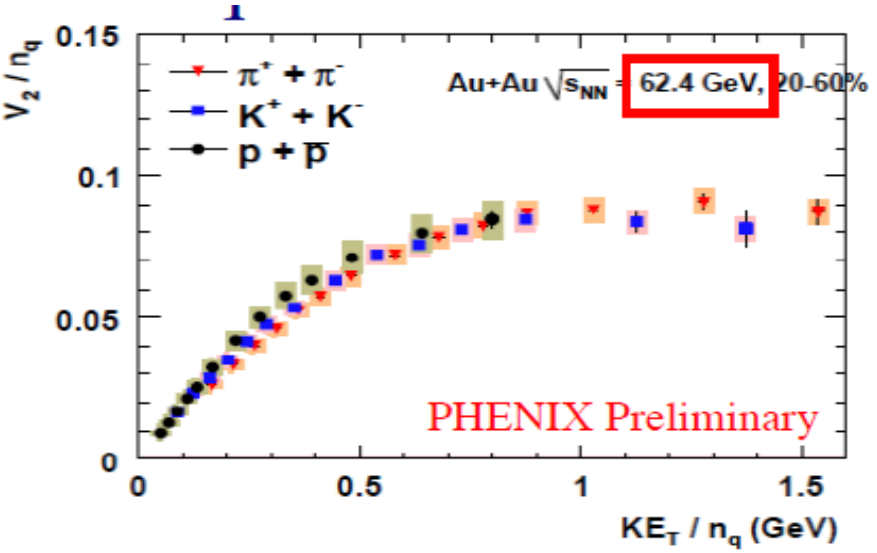
V_2 have no difference from 200GeV to 39GeV

PID v_2 in 39 62



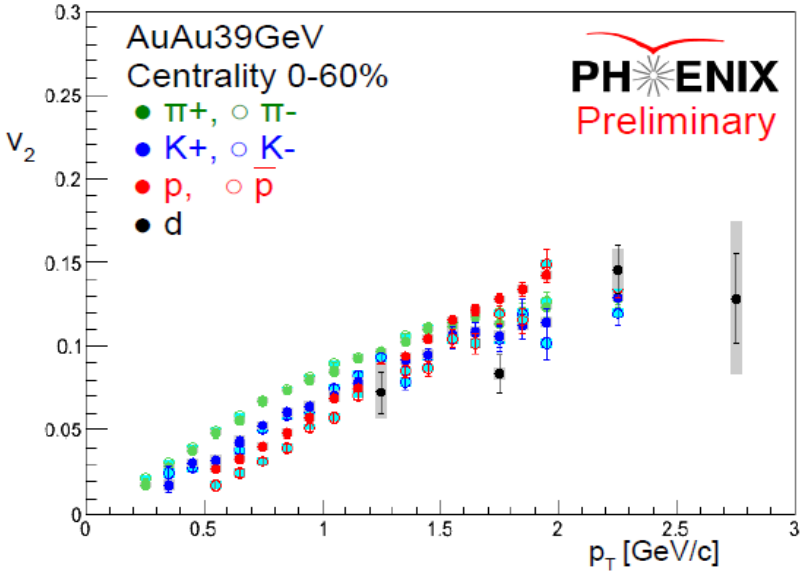


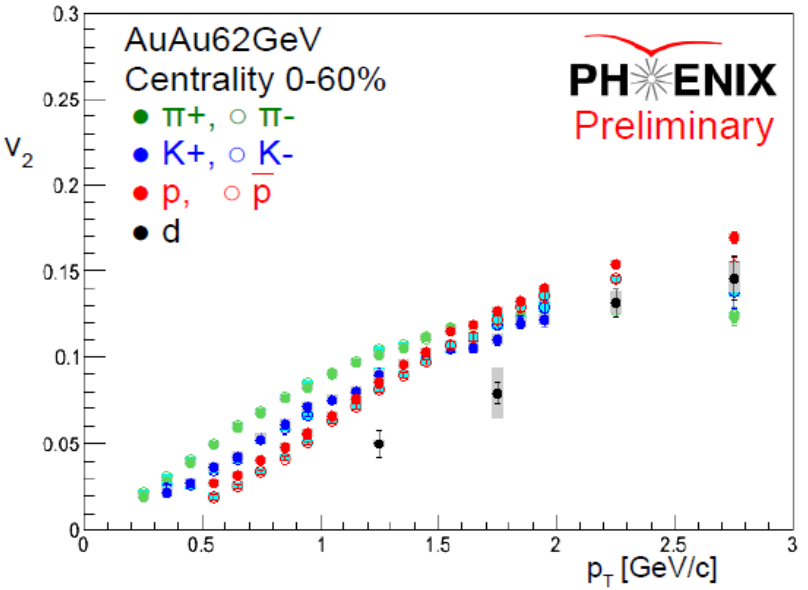


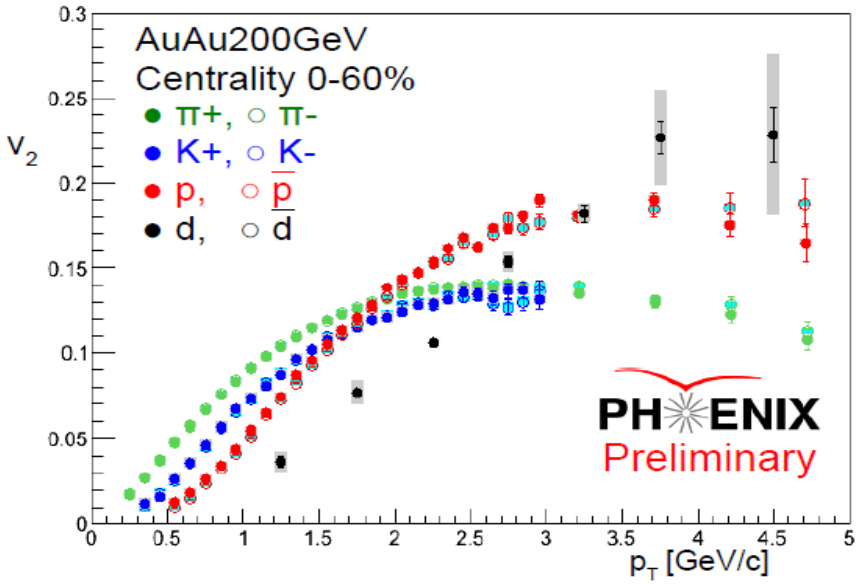


$p+\bar{p}$ is slightly large at n_q scaling

Charge separated PID v_2

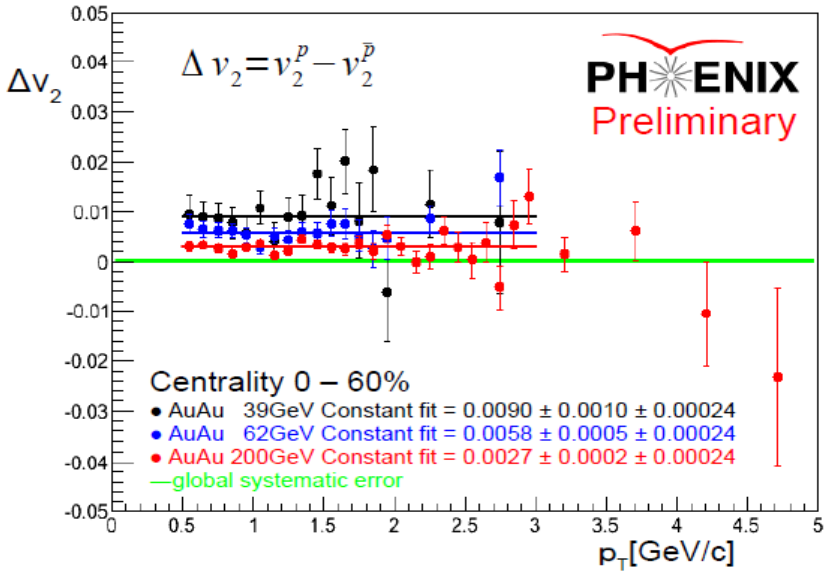






Proton have larger v2 than that of anti-proton at low energy collision (39, 62GeV)

Difference v_2 between +/- charge



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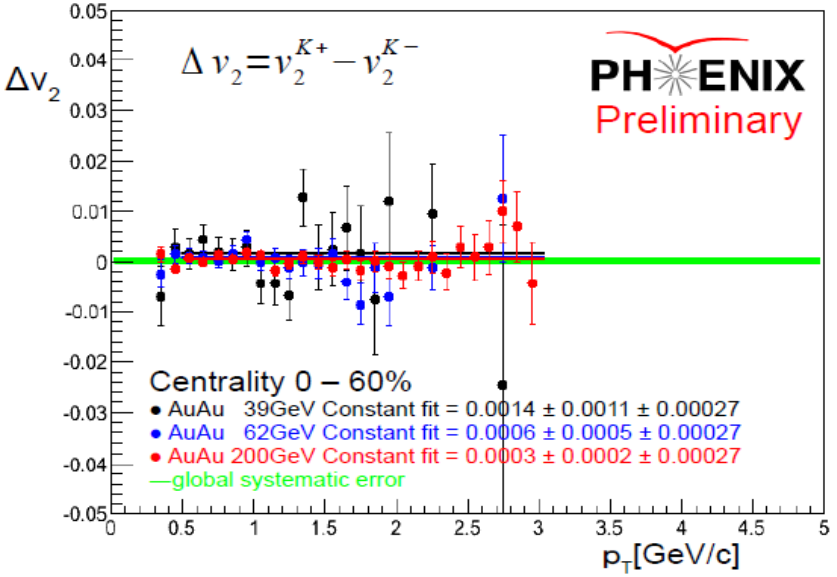
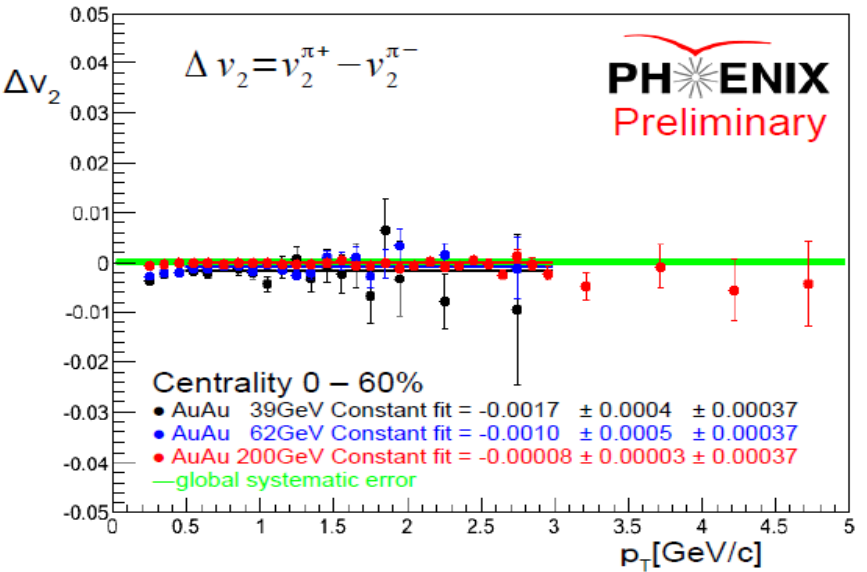
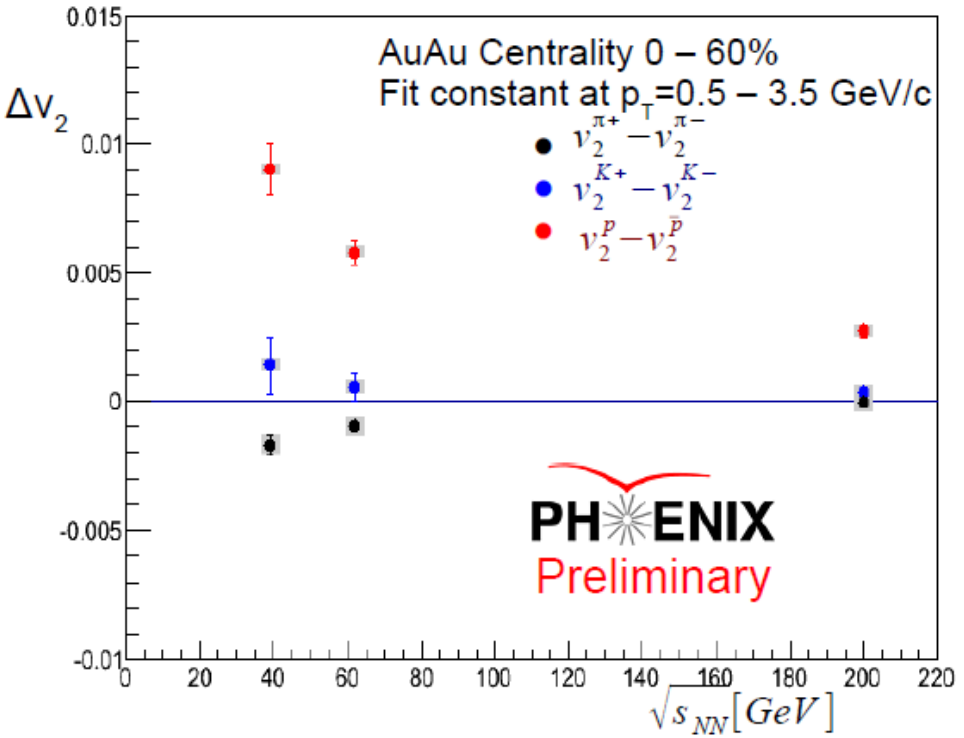




Collision energy and Δv_2



- p-$\bar{p}$ are deviated at low energy collision
  - The v_2 difference is flat to momentum.
- π- v_2 has slightly larger than π+
- K v_2 has no difference for +/- charge
- Annihilation effect with large net-baryon ratio ?

Summary

- V_2 of π+,π-,K+,K-,p,$\bar{p}$,d were measured at AuAu $\sqrt{s_{NN}}$=200, 62 and 39GeV
- Proton v_2 and anti-proton v_2 are deviated
  - The difference increases to low energy collision
  - The difference is flat to momentum.
  - π- v_2 has slightly larger than π+
  - K v_2 has no difference for +/- charge
- It leaving from NCQ scaling
  - Due to large net-baryon baryon ratio？